TPEG

— standardized at last ... but this is only the beginning

Bev Marks
TPEG Forum Chairman

TPEG technology has been quite a long while in the making – compared with some other technology developments. This article explains how the development of a worldwide standard necessarily takes time to obtain a wide ranging understanding and buy-in from the relevant business sectors. Furthermore, it describes the need for long-term ongoing development and support of the TPEG "tooklkit", which shall be extensible to allow for future needs.

Perspectives

The main topic of the International Standards Organization Focus magazine of May 2005 [1], concerned standards for vehicles under the strap line "On the road again…". Eduard Michelin (Yes - of the tyres family) is quoted as saying: "ISO standards offer an international reference".

In the last year, the TPEG development work has been recognized through two series of international standards. TPEG technology is now standardized in two CEN and ISO Technical Specifications, comprising ten parts. Looking back to the initial internal EBU meetings – the first was held in November 1997 – the development of TPEG technology seems to have taken a long time. Indeed some 7 years is long for a modern technology but the EBU resolve to work with the industry to develop a new Traffic and Travel Information (TTI) technology for the 21st century needed time to obtain "buy-in" from a wide range of interested parties. It is now possible to say that this has been achieved, because the international standards process requires developers to submit their work to a rigorous Comments process, which both the ***TPEG Binary*** [2] and ***tpegML*** [3] specifications have satisfied.

We now have a working platform – indeed an international reference – which offers much more than the November 1997 meeting envisaged.

TPEG Binary – originally developed for Digital Radio delivery	CEN/ISO TS 18234-Series Adopted: 2004-08-27
tpegML – developed for Internet bearers and message generation using XML	CEN/ISO TS 24530-Series Adopted: 2005-02-04

Figure 1
TPEG Standards

Initially TPEG was imagined to be important in the so-called ***Delivery Segment*** and it was only later

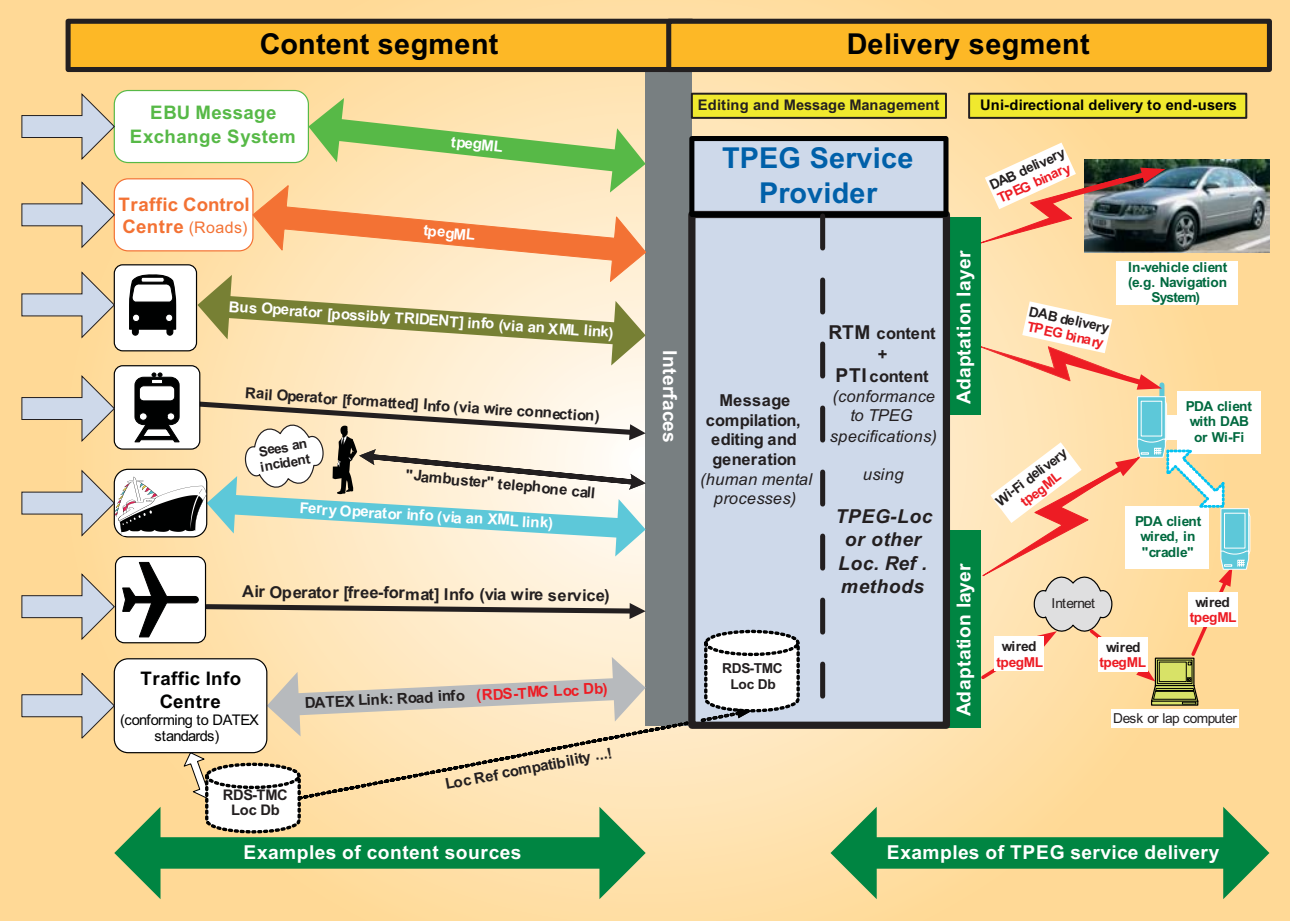

Figure 2
Content and Delivery Segment diagram

– when taking the whole information chain into account — that the ***Content Segment*** could also be seen to benefit from the development of tpegML *(see Fig. 2)*.

Like all good ideas, and given massive human resources commitment from the developers, the original EBU Broadcast Management Committee (BMC) brief to the B/TPEG Project Group [4] was exceeded when they realised that tpegML just *had* to be developed. Indeed the earliest test implementations used DAB for limited periods, but the longest lasting use of tpegML has been the BBCi website where tpegML has been the underlying technology for nearly 5 years duration, enabling the EBU to demonstrate many of the TPEG attributes with relative ease. Establishing an on-air test transmission and building one-off receiver/decoders is rather difficult by comparison with logging on to a webpage with a standard browser, yet this delivery of TTI – with language independence and hot links to maps (available from established providers) – is a very powerful demonstration of the utility of TPEG technology for all to see.

Introduction

There have been a number of previous articles [5][6] on TPEG as the development process has gone forward, so it is suggested that the reader has a look at them for some general background – and especially to start to feel comfortable with the many abbreviations used in this connection. Nevertheless, the reader should also look at the end of this article for a small set of abbreviations that will be used frequently from here onwards.

The CEN/ISO TS standards cover considerably more than originally envisaged by the EBU BMC because, around the year 2000, it became obvious – in Europe at least – that there was a growing desire to improve personal mobility through providing information to the traveller so that more multi-

modal journeys would be considered and undertaken. Clearly a help in this would be TTI that covered ***public transport***. This had never previously been covered by data-delivered TTI technologies, yet is recognized by spoken services in particular (usually, though not exclusively, radio delivered). Indeed TPEG developments had started out by attempting to match the abilities of RDS-TMC. But it had to go beyond the earlier standard in terms of content detail and without its several constraints – such as the need for a common location database in all client devices that perfectly matched that of the service provider. This is something that only recently (say during the last five years) has became practical to realise. In order to generalise on some aspects of the TPEG technology approach, the specifications were deliberately broken into several parts, which explains why the CEN/ISO TS 18234-Series finished up comprising six parts to describe the really two key Applications: ***Road Traffic Messages*** and ***Public Transport Information***. In fact quite late on in the development process it was realised that a common ***Location Referencing*** method could be detached from these applications and separately specified to be suitable as a basis for other location-based applications that would be developed in the future.

TS Part Topic	CEN / ISO TS 18234 Series	Mapping	CEN / ISO TS 24530 Series
Introduction, Numbering and Versions	Part 1		- -
Syntax, semantics and Framing structure	Part 2		- -
Service & Network Information application	Part 3		?
Road Traffic Message application	Part 4	<mapped>	Part 3
Public Transport Information application	Part 5	<mapped>	Part 4
Location referencing for applications	Part 6	<mapped>	Part 2
Parking Information	tba	<tba>	To be Part 5
Congestion and Travel-Time information	tba	<tba>	To be Part 6
Introduction, common data types & tpegML	- -		Part 1

Figure 3
The open TPEG standards and their mapping

So today we have two separated TS series for TPEG Binary and tpegML (notice the notation we have chosen: small “tpeg” letters with large “ML”), with intentional mapping between the series where possible *(see Fig. 3)*. In a very pure sense, the mapping is not quite exact because of the additional functionality that has been built into tpegML for use in the Content Segment which requires some small additional elements, but within each tpegML part there is a subset which does map exactly.

Current areas of Standards development work

The EBU continues to sponsor TPEG development work, now through the TPEG Forum, which is at the early stages of formation and presently operates through two task forces: the ***Standards Task Force*** (STF) and the ***Implementation Task Force***. The former has effectively taken over the role of B/TPEG and continues, albeit in a lower resourced way. The latter, on the other hand, is attempting to make sense of the myriad requests for using TPEG technology and hoping to show how the adopted Open Standards apply to the many ideas and requests. These standards, even before adoption and publication, aroused considerable interest from the Asia-Pacific region and, through ISO Work Items for ***Parking Information*** (PKI) and ***Congestion and Travel-time Information*** (CTT), the development has continued strongly – supported by Japanese and Korean delegates, as well as European delegates. It is interesting to note that these Work Items only called for tpegML

specifications to be produced; to date we do not have requests for Binary versions but it is believed that Binary versions can be produced fairly easily if required.

It has become obvious that XML is an easily understood notation for standards development and indeed UML modelling has been extensively used by the STF in carrying out the PKI and CTT development work. At present the PKI application is undergoing the CEN/ISO Comments stage before a final push to complete the specification ready for international voting so that Part 5 of the CEN/ISO TS 24530 Series can be adopted. Meanwhile the work on CTT has shown that some upgrades will be required to tpegML Part 2 to satisfy the need to describe linked segments of a route. This work has also further highlighted the differing Location Referencing methods in use worldwide which TPEG needs to accommodate.

The section called "*Location referencing*" (on page 8) explains this in more detail.

The structure of TPEG messages

Every TPEG message comprises a number of elements according to the needs of the message content and this will be explained more fully after the overall structure *(see Fig. 4)* is explained.

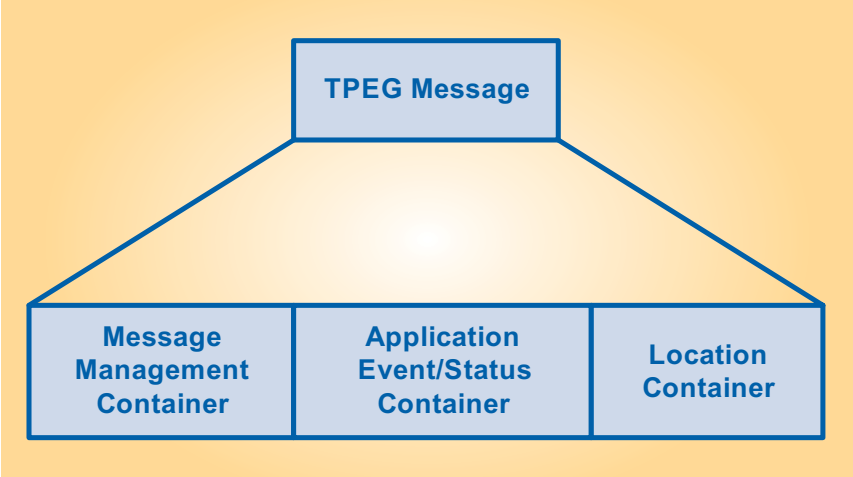

Figure 4
The TPEG message containers concept

The original developers based many ideas on the earlier RDS-TMC data delivery mechanisms and learnt a number of lessons about Message Management – particularly realising that some elements are vital for all messages and others could be optional for each message. From this comes a general point about all TPEG technologies: although the Standards have many capabilities, it is for a Service Provider to decide on which elements shall be used in each message. This comes about by using an entirely declarative structure, such that any decoder can comprehend the data elements according to its need and use them accordingly.

Each message needs some event or information content and thus another container is assigned to this role – varying significantly according to application. This is recognized by the documentation of separate Parts for the varying applications (e.g. RTM or PTI etc.)

Finally, as so many applications are location-based, a container is assigned to Location Referencing. ***TPEG Loc Ref*** is defined in the TS series for any application message.

The elements of the Message Management Container are:

- **MID** Message ID
- **MGT** Message Generation Date and Time
- **MET** Message Expiry Date and Time
- **VER** Version Number
- **STA** Start Date and Time
- **STO** Stop Date and Time
- **SEV** Severity
- **UNV** Unverified Information

- **(CRI)** Cross Reference Information (to date: just a concept – not yet fully specified)

For a detailed understanding of these elements, the reader should refer to CEN/ISO TS 1823-4 [2]. Of these elements, only MID and VER are mandatory – all others being optional according to the message content demands. A special combination of MID and VER with the value VER=255 allows a minimum data delivery of a cancellation for the message with matching MID and does not require an associated Location Container to be used.

The elements of the Message Event / Status Information Container form the main part of each standardized application. It is interesting to note the highly customised structures that have been developed for differing applications. In the case of the RTM application, a fairly deep structure has been selected to allow varying levels of detail to be delivered and even to be comprehended by client devices. In the PTI application, on the other hand, a relatively shallow structure is adopted to satisfy the need for viewpoints of PT services, assuming the end-user has only limited geographical or temporal understanding of a particular service that may be of interest to him. For a detailed understanding of the elements that each application uses, the reader should refer to CEN/ISO TS 1823-4/5 [2].

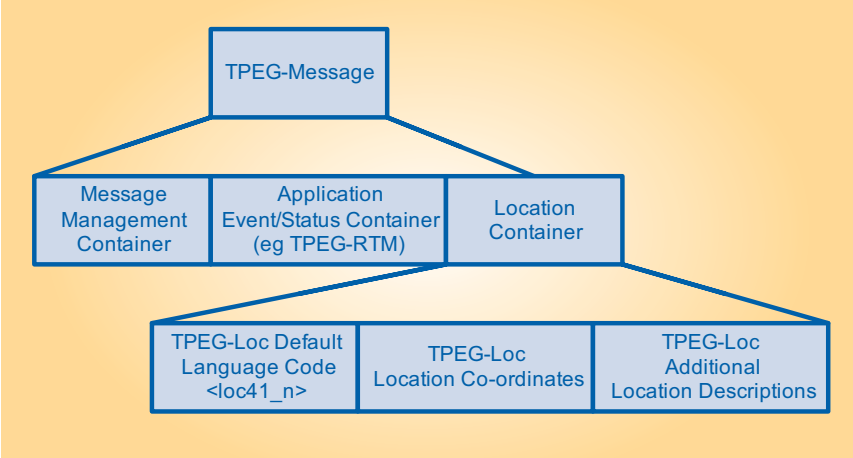

Figure 5
The TPEG-Location container concept

The TPEG-Location Container *(see Fig. 5)* has a potentially wide and deep structure. For a detailed understanding of these elements the reader should refer to CEN/ISO TS 1823-4 [2]. This container has a quite challenging brief: to provide both human and machine readable content and to take account of multiple descriptions in bi-lingual locations such as Brussels where many road signs are shown in both French and Flemish. Furthermore, the TPEG-Location container may include references to more detailed Area, Network and Node descriptions. In the course of development, several news ideas were incorporated into TPEG-Loc, such as the “Framed Point” type which allows a Service Provider to describe a location on a road where for example a roundabout is located and an event needs to be localised for a short period covered by a special speed restriction. The established local name – possibly unknown to many travellers (e.g. Bowship roundabout) which is 3 km from one town (e.g. Hailsham) and 6 km from another town (e.g. Horam) can be described for an end-user with little detailed geographical knowledge of the area, but who should know that the message is applicable to the vicinity of one of the towns mentioned!

Altogether seven Location types have been developed. They are:

- Large Area
- Nodal area
- Segment
- Intersection point
- Framed point
- Non-linked point
- Connected point

Now, with implementation experience beginning, calls for more Location types are being considered. Relatively this is easy to accomplish with the TPEG toolkit being designed explicitly for long-term extensibility.

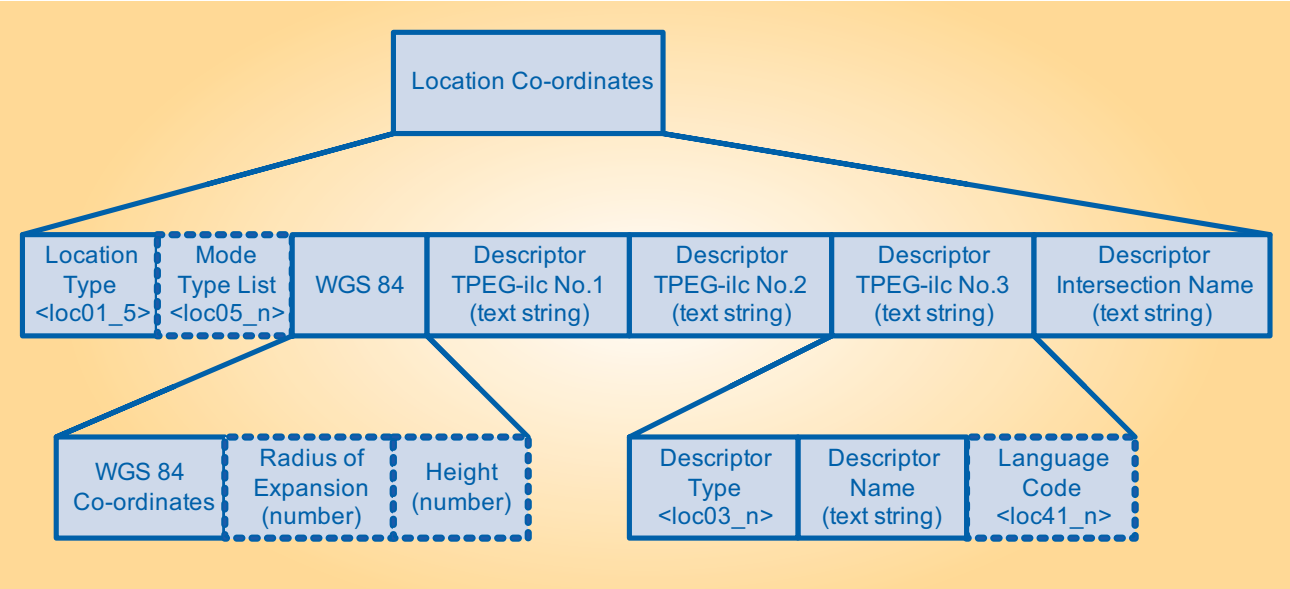

Figure 6
The TPEG-Location Intersection Point detail

Fig. 6 shows more detailed elements that are delivered in one of the simpler Location Types – for an Intersection point based upon the earlier so-called ILOC method but with enhanced description capability.

Maintaining / developing the TPEG Standards

Maybe it appears that, after seven or so years of development, the time has come to put down all the TPEG Standards development work. However, such a position would miss the point that when people implement any standards, new needs and ideas are discovered – some are just a matter of educating users about the capabilities of the TPEG Toolkit, but other needs are real for a practical implementer.

One of the very first reports heard by the TPEG Forum ITF was about the desire for EBU Member broadcasters to find an economical way of transitioning from their existing RDS-TMC services to TPEG-RTM service provision. With new services it is often the case that, for quite long periods, there will be few users until client devices become common-place and the transition period for broadcast technologies becomes relatively long. Undoubtedly this will be the case with TPEG technology – indeed the TPEG Project understood this issue rather well and advised the European Commission in one of its deliverables that public uptake was only likely to begin in 2007 or thereabouts.

Nevertheless a few leading Service Providers are already beginning to implement TPEG-based services and their chosen route is to take their existing RDS-TMC service and automatically convert it to a TPEG-RTM service and put it on-air. Given that the TPEG-RTM design was modelled on RDS-TMC, this should be an easy thing to achieve. However studies undertaken by the IRT have shown that whilst possible, improvements to TPEG-RTM would be sensible in order to achieve a high quality result. The conversion rate without any upgrade is in the order of 80% satisfactory, but the studies have shown that with a relatively small upgrade this can be improved within a few percent of 100% conversion success. As a result, the TPEG Forum STF has a high priority Use Case to undertake the upgrade.

In this case the TPEG Forum structure has proved very important – real market-led requirements are needed to ensure that all development work is highly focussed on the needs identified and, given the small human resources available, that commitments from the few companies prepared to

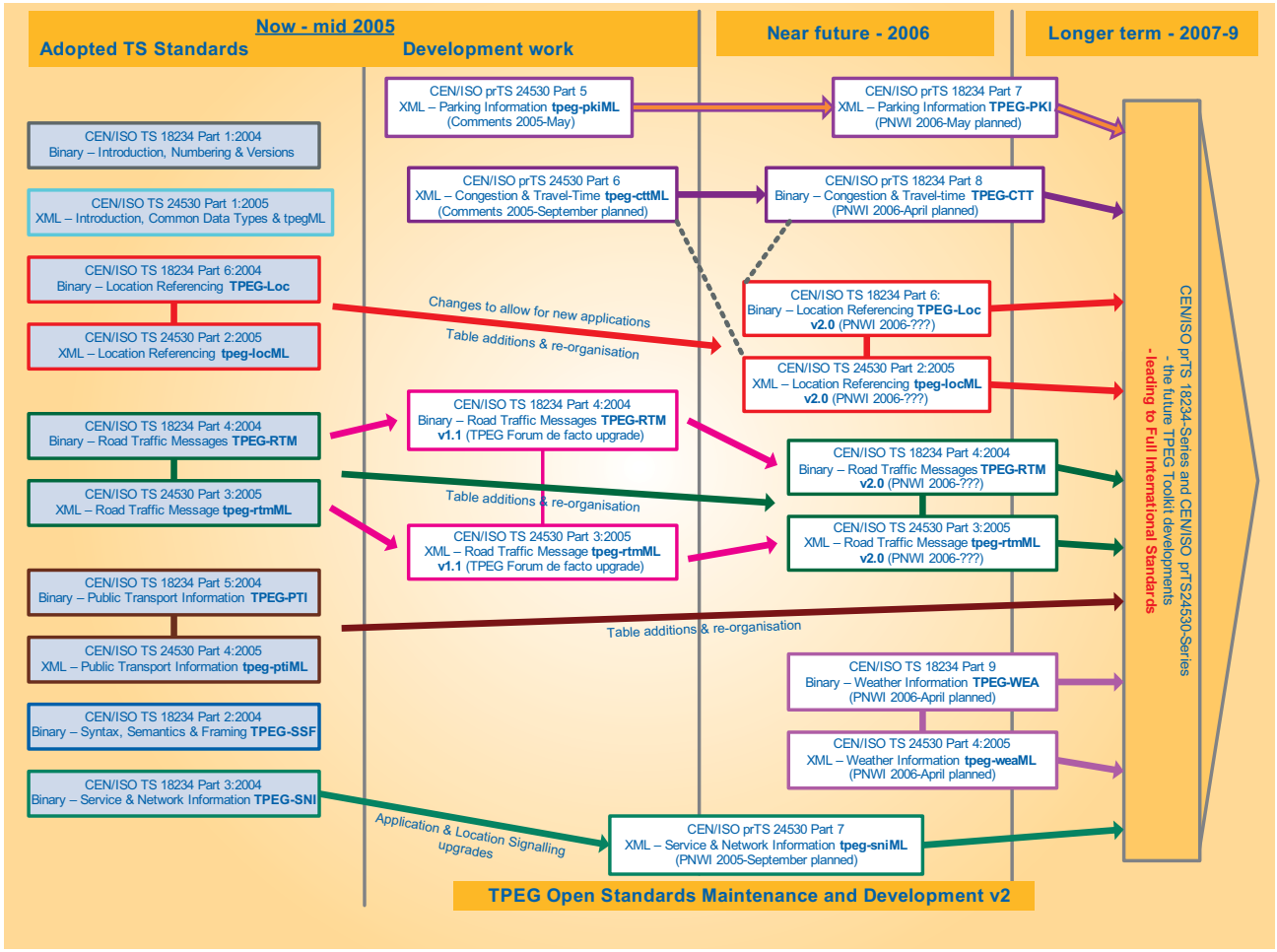

Figure 7
TPEG standards development "Road Map"

work on such matters can be channelled into drafting group work which leads directly to improvements in the TPEG Toolkit.

This is but one example; however it has shown the need for overall control of development work and a visibility to it which can quickly be grasped by the many new participants in the development and implementation of TPEG technology. In response to the need for ongoing negotiations about Use Cases and resource deployment, the TPEG Forum has recently drawn up an initial "Road Map" for standards development *(see Fig. 7)*, which is considered to be a "live document" and which will change to meet the market needs for TPEG technology.

While the final stages of voting for international standards take quiet a long time (typically 12-18 months), the TPEG Forum did not stand still and new work was already starting. A draft for ***tpeg-pkiML*** (Parking Information) is already at the Comments stage and work has begun on ***tpeg-cttML*** (Congestion and Travel-Time Information). As noted above, this work has been motivated by the Asia-Pacific region but they have different ideas about delivery platforms from Europe – they are thinking about DMB and in Japan, ARIB – digital TV delivery. Thus the tpegML standards are interesting for them and, so far, no call for Binary application standards has solidified.

Yet in Europe other moves are beginning to surface which may mean that TPEG is going to be delivered in both Binary and XML modes. Thus probably, in the end, all Applications will need mapped standards.

The TPEG "Road Map" shows that if tpegML becomes an implementation requirement, then we would need a ***tpeg-sniML*** application to be drafted quite soon to support some of the important service management issues that are inherently in the Binary TPEG-SNI application. Furthermore it shows that already within the TTI community, a need for TPEG-WEA and tpeg-weaML has been confirmed as a market-driven requirement.

TPEG Standards development and maintenance appears to have a very crowded and busy “Road” ahead in the next few years, if the standards are to keep pace with the aspirations of the TPEG Forum membership and keep the “international reference” they offer today.

Current developments

In the middle of 2004, at the suggestion of the TMC Forum, a joint meeting with the TPEG Forum was held to consider how even greater market- driven developments for Road Traffic Information technology could be managed. As a result the Road Traffic Information Group (RTIG) was initiated. RTIG has now met four times and is beginning to produce some very interesting results. It has enabled a national project named **mobile.info** based in Germany to begin to express its intentions to use some aspects of both RDS-TMC and TPEG technology. Clearly, TPEG – with a diverse range of interest including Public Transport, Parking and Weather – has a much wider range than RTIG is addressing, but it is potentially advantageous to develop the RTI aspects in a co-operative manner, especially if it will lead to a quicker uptake of TPEG-based services and inclusion of TPEG-based clients into many different car manufacturers’ products.

RTIG has really exposed two key issues: the location-referencing needs for Navigation Systems and the need for a better understanding of TPEG Profiles.

Location referencing

The mapping and consumer electronics industry have been working on a location referencing method which they claim is necessary for service provider-to-client device on-the-fly map matching, as required for turn-by-turn dynamic route guidance navigation systems. The method named AGORA-C has been under development for several years and although TPEG developers were aware of the work, they had to go with TPEG-Loc because the AGORA consortium had not published their work when TPEG-Loc was finalised in 2003. Now however, the mobile.info project has decided to opt for using AGORA-C rather than TPEG-Loc. This brings to the frontline several challenges.

TPEG-Loc is designed for all potential client types – simple non-map-based **thin-clients** that are only able to deliver text to describe allocation, as well as offering machine readable content for **thick-clients** such as navigation systems.

On the other hand, AGORA-C is only designed for thick-clients with considerable processing power and it has an embedded bit-oriented coding structure that does not carry any descriptive text content directly. Furthermore, it carries IPR constraints that none of the TPEG Standards (which are fully Open Standards) have.

Through the RTIG processes, a solution has been determined which will require an upgrade to TPEG to allow “Another Loc” method *(see Fig. 8)* to be signalled and used within TPEG messages. An additional point is that mobile.info, for transitional reasons, also

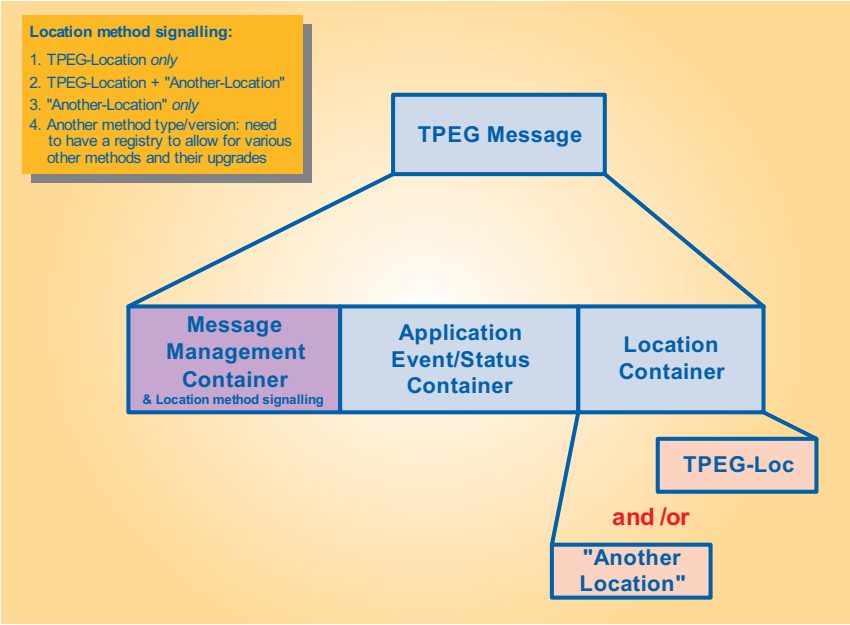

Figure 8
TPEG-Loc with “Another Loc” added

wants to utilise RDS-TMC location codes in certain messages. As a result, the TPEG Forum has offered to develop the necessary technology for "Another Loc" to accommodate these needs. As a spin-off, this also potentially helps define a method giving even greater flexibility for other location methods used in the Asia-Pacific region, such as the Japanese and Korean Link ID location methods.

Whilst the "Another Loc" method will suffice in the short term (with potentially specifically hard-encoded client devices), it will be necessary to develop and implement changes into TPEG-SNI to allow "higher level" signalling in the channel to signal to client devices in advance of fully decoding potentially non-useful messages.

TPEG Profiles

During the RTIG discussions to achieve better understanding of the rather challenging Location Referencing debate, it became obvious that there was a need to explain in some simple terms just what profile of the TPEG Toolkit was actually being debated. Originally, the TPEG development work had not considered the concept of profiles and indeed an original design concept was that the Open Standards would actually be a Toolkit. This would allow any service provider a very free choice as to what he wished to implement and, assuming that clients had full capability, would thus be able to deliver to the end-user what the service provider had intended, without any client device "tuning". This is a powerful concept that allows service providers to address the market place as they think fit and to gain significant market advantage according to their viewpoint. Furthermore, because TPEG is hierarchically structured, client-device vendors similarly have significant product differentiation opportunities.

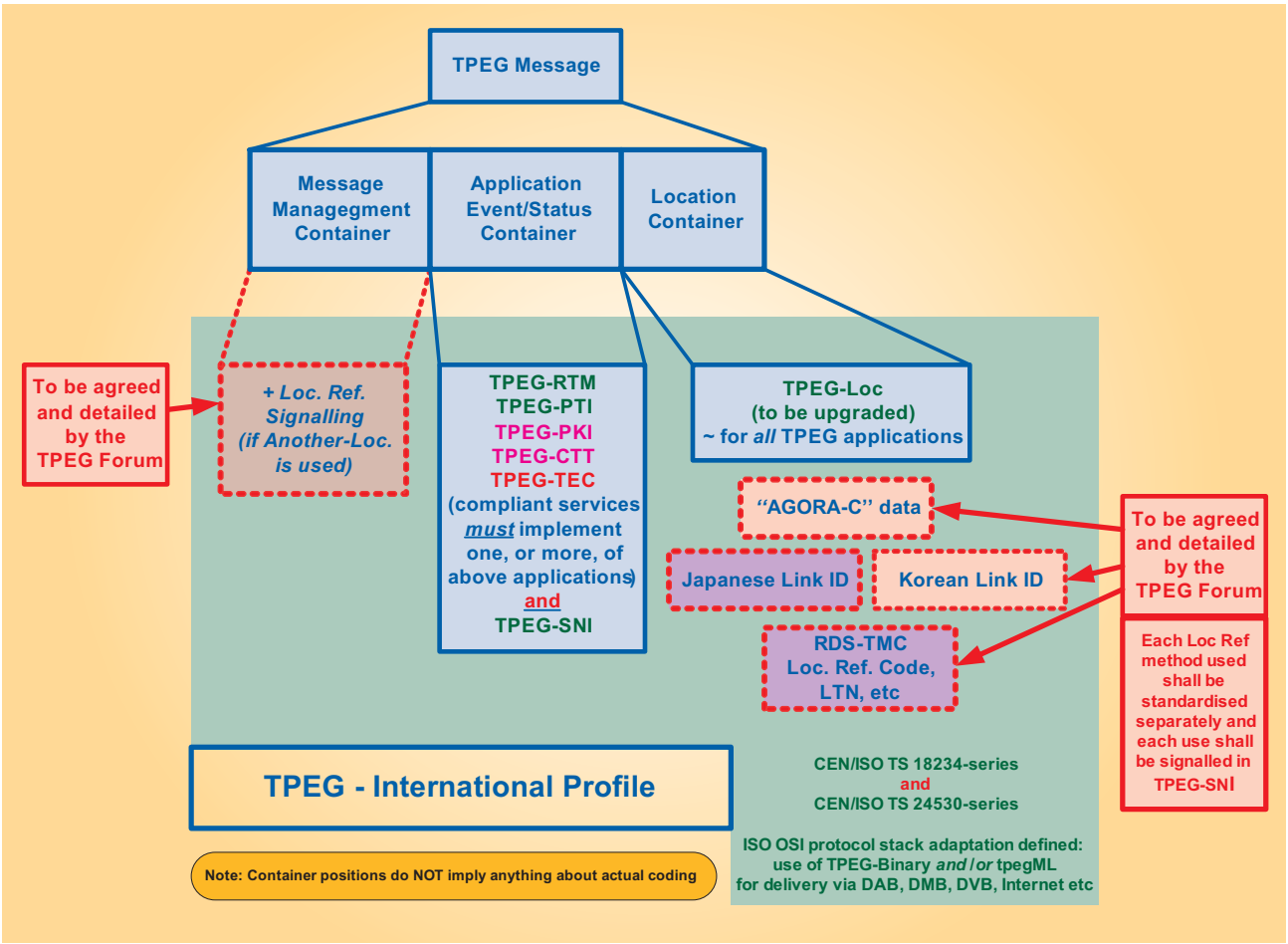

Figure 9
TPEG-International Profile

Nevertheless the automotive industry, through the mobile.info project, has a very strong desire to obtain consumer electronic equipment including Navigation Systems from their first-tier suppliers, with significant guarantees that meet the automotive industry specifications. It is said that the only way at present to achieve this is by the use of AGORA-C.

Without the benefit of significant research, it is difficult to judge whether TPEG-Loc or AGORA-C is best suited to the long-term needs of dynamic route guidance Navigation Systems. As a result, the IRT will be undertaking some research on this and will publish the results later for the benefit of the whole professional market place. In the meantime, we have results from the AGORA consortium which has tested 1000 or so locations, deriving referencing location data from one map and then using a different map from another supplier to enable a dynamic route guidance system to achieve a high map-matching hit rate (>95%). We will have to wait some while before knowing if the map-matching challenge described by AGORA is a systemic digital mapping problem or something more.

So, in order to keep TPEG on track and moving forward to satisfy short-term desires to use the technology, a solution has been found and now needs to be developed within the TPEG Forum to become an upgraded method for these implementation needs.

Returning to Profiles, the TPEG-International Profile may be visualised as shown in *Fig. 9*. This diagram attempts to show the points raised in respect of a single TPEG Message within a service and how it may flexibly offer location referencing for any market so far interested, yet potentially allow more location referencing needs for the future.

With this in mind, it is now possible to visualise the so-called TPEG-Traffic Event Compact ideas of the German mobile.info project and how they may fit as a potentially new TPEG application into the TPEG Toolkit, as shown in *Fig. 10*.

Given that the original TPEG developers did not consider profiling, this looks like a rather satisfactory outcome – it is possible to visualise what from the TPEG Toolkit is being discussed and thus what from the TPEG Standards will be implemented.

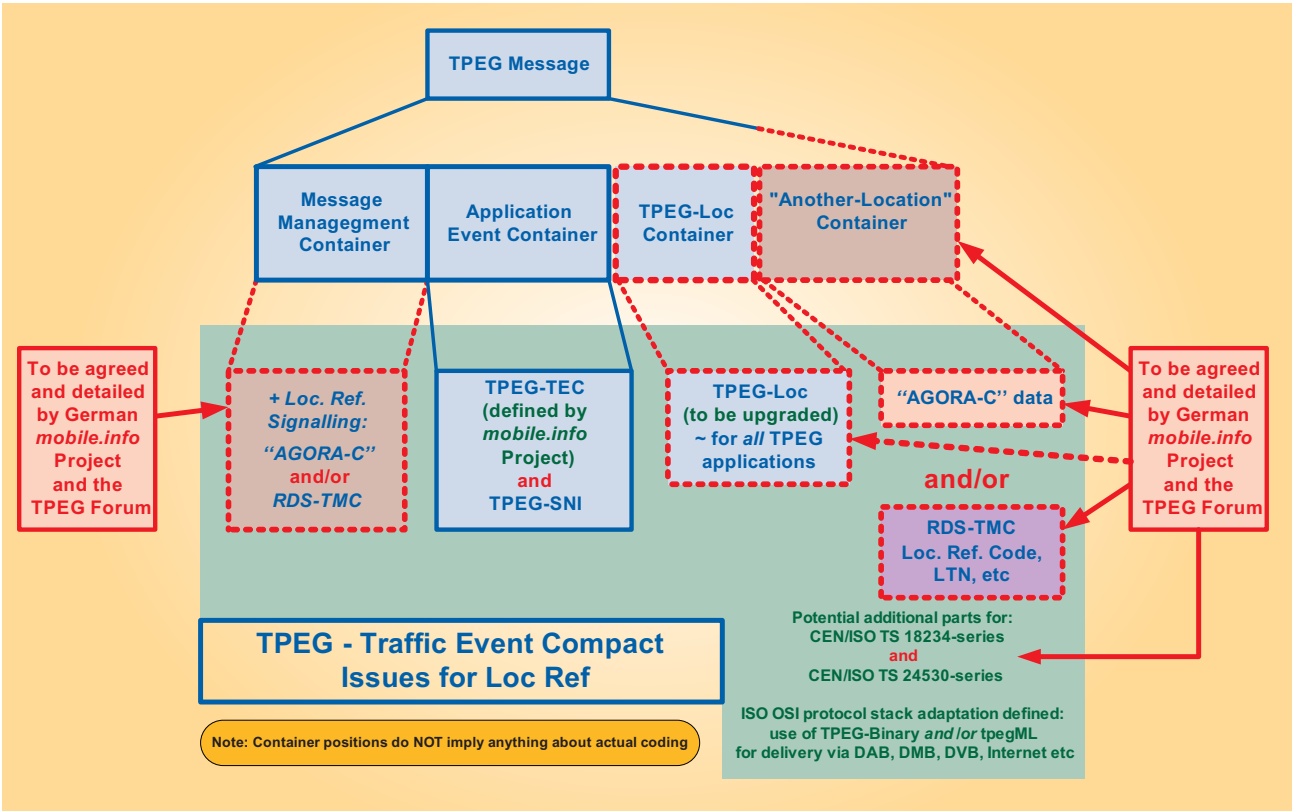

Figure 10
TPEG-TEC Application

But this does raise the big question: *"What is the core TPEG Profile?"* At this stage the question is only just beginning to be asked within the TPEG Forum. So in this article there is no answer to the question. There are some pointers and it is also the case that naming conventions will have to be sharpened considerably if the TPEG users and developers of the future are to remain able to talk to one another with good levels of understanding. The TPEG Forum does not, in turn, want to leave these matters to be accidentally adopted into some sort of slang language where people have their own private interpretations of what a particular profile means.

TPEG naming conventions are now in sharp focus. Because TPEG is bearer independent, it has to sit happily with all the other naming conventions of bearer platforms. The TPEG Forum has noticed that these naming conventions can be very inconsistent … just look at the use of T-DAB, DVB-T and now DVB-H, which have found their way into public marketing – yet lack a consistent approach and probably mean very little to most end-users. The TPEG Forum does not yet have the answers, but it will have to find them (and fast) before custom and practice overcomes a logical approach.

TPEG for Content Generation and Distribution

The EBU commitment to TPEG technology is very well demonstrated by the TTI Group's request for and support of a language-independent exchange of content among EBU Members using TPEG technology. The EBU TTI Message Exchange System (MES) is now coming to fruition and uses TPEG at its core in a server and web client, situated at the EBU Headquarters in Geneva.

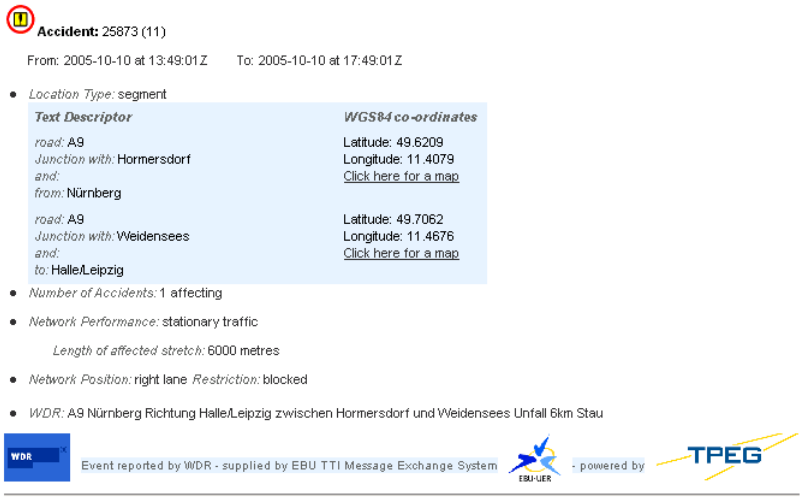

Figure 11
EBU TTI Message Exchange System webpage – rendered in English

Figure 12
EBU TTI Message Exchange System webpage – rendered in French

Many EBU Members have been exchanging pre-edited TTI content via an e-mail list for some years, but it is not language independent and requires translation from the originators language to the user's language. This is done at the receive point and relies upon TTI editors with the necessary skills. Thus it has been difficult to extend the exchange to some Members. But with the advent of TPEG technology, an opportunity has been seen.

Participating members with message-generation systems for their day-to-day editing needs can, with relatively small effort/costs, implement a "TPEG Output" that – by ftp connection to the EBU TTI MES – can deliver their pre-edited content into an international TTI database, which internally reads the TPEG Message Management Container elements to keep, and then ultimately delete messages automatically as they expire. Then, with simple easily-available browsers (e.g. MS

Bev Marks trained at the BBC and qualified as a broadcast and communications engineer in 1968. He pursued a varied career with the BBC, in both radio and television engineering, eventually specialising in news and presentation studios, and network distribution areas. He was Project Manager of the multi-disciplinary Radio Data System (RDS) implementation team and the BBC Travel Information systems team that installed the first computer-based BBC Travel reporting systems in Police control rooms and Traffic Information Centres, linked to the BBC Travel Centre studios.

Mr Marks has worked as a freelance broadcast engineer since 1994. Between 1996 and 1999 he represented the EBU as their RDS-Traffic Message Channel broadcast systems expert within the EC-supported EPISODE Project. During the same period he was the EBU technical expert in the EC-funded HumiDAB Project concerned with HMI issues in the complex multi-functional Digital Radio domain. Since 1998, he has been centrally involved in the EBU-initiated Transport Protocol Experts Group (TPEG). Additionally he led Work Package 4 within the EC-supported TPEG Project, liaising with CEN and developing the Guidelines for TPEG implementers.

More recently, Bev Marks been instrumental in establishing the EBU-initiated TPEG Forum, having undertaken various leading roles in the Standards Task Force and Implementation Task Force. He is currently representing the EBU in an EC-funded Project called GST IP Safety Channel which aims to utilise many TPEG technology aspects. He is also Secretary of the EBU multi-disciplinary TTI Group, advising on technology strategy issues, covering the full range of broadcast delivery technologies including FM radio, Digital Radio, Television, Teletext and the Internet.

Internet Explorer v6.0), any registered EBU Member can access the TTI content when he wishes. By the use of XSL, he will see the content regardless of the originator in his own language *(see Figs 11 and 12, which show the same event rendered in two languages)* and may use it immediately, knowing that it has already been verified to a broadcast editorial standard by a fellow EBU Member.

With European travellers crossing borders regularly, TTI content – which falls into the guiding principle that it shall comprise issues which drivers should know, if they are a considerable distance away from their home country (say, at least 1 hour) – is considered to be a very useful addition to nationally-collected content.

It is hoped that this EBU service – starting as a small service to Members only (it is not intended for public access) – will one day grow with other available applications and will become of wider use than just TTI. Could it, for example, be a way of exchanging Weather information?

Perspective again

Recently in the UK, the national Highways Agency has opened an internal users website using OTAP technology that has adopted TPEG-Loc. They have a rather tenuous link to broadcast technology in their daily lives yet, through the TS Standards, have found out about TPEG and adopted an important part of it for their own purposes.

The challenge for the TPEG Forum is now to find the human resources to take these standards forward with all the necessary upgrades and additions to full International Standards and keep alive the reference they provide as well as being reactive to the market place.

The TPEG ISO TS standards certainly do offer an international reference for future TTI data services in many, if not all, parts of the TTI value chain – from content collection through to delivery to the end-user.

Finally, two documents are currently being prepared by the EBU Technical Department on TPEG: Tech 3302 and Tech 3303. They will shortly become available (in PDF format) via:

http://www.ebu.ch/en/technical/publications/tech3000_series/index.php#1

References

[1] ISO Focus Volume 2, No. 5, May 2005 ISSN, 1729-8709

[2] TPEG Binary as standardized in CEN/ISO TS 18234-Series, adopted 2004-08-27

[3] tpegML as standardized in CEN/ISO TS 24530-Series Adopted: 2005-02-04

[4] B/TPEG Project Group see: **http://www.ebu.ch/en/technical/projects/completed/index.php**

[5] EBU Diffusion 2004/34 (English and French)

[6] TPEG Project: "TPEG - What is it all about?" 2003-08

Abbreviations

Abbreviation	Explanation
ARIB	Association of Radio Industries and Business (Japan)
B/TPEG	Broadcast/TPEG (the EBU project group name for the specification drafting group)
BBCi	British Broadcasting Corporation's internet services
BMC	(EBU) Broadcast Management Committee
CEN	Comité Européen de normalization (European Standards organization)
CTT/ctt	Congestion and Travel-Time (Binary and XML notations)
DAB	Digital Audio Broadcasting
DMB	Digital Multimedia Broadcasting
DVB-H	Digital Video Broadcasting - Handheld
DVB-T	Digital Video Broadcasting - Terrestrial
EBU	European Broadcasting Union
ILOC	Intersection Location (location referencing method based on 3 short string decriptors)
IRT	Institute für Rundfunktechnik, Munich, Germany
ISO	International Standards Organization (Worldwide Standards organization)
ITF	Implementation Task Force (TPEG Forum group)
MES	Message Exchange System
OTAP	Open Travel-data Access Protocol (see **http://www.itsproj.com/otap**)
PKI/pki	Parking Information (Binary and XML notations)
PTI/pti	Public Transport Information (Binary and XML notations)
RDS	Radio Data System (an FM radio data channel feature)
RDS-TMC	RDS-Traffic Message Channel (an RDS feature)
RTM/rtm	Road traffic Message (Binary and XML notations)
SNI/sni	Service and network Information (Binary and XML notations)
STF	Standards Task Force (TPEG Forum group)
T-DAB	Terrestrial - Digital Audio Broadcasting
TPEG/tpeg	Transport Protocol Expert Group (Binary and XML notations)
TS	Technical Specification (CEN/ISO standard)
TTI	Traffic and Travel Information
UML	Unified Modelling Language
XML	Extensible Mark-up Language
XSL	Extensible Stylesheet Language